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2019 年 03 月 04 日
Year Month Day

学 位 （ 博 士 ） 論 文 要 旨
(Doctoral thesis abstract)

論文提出者 Ph. D. Candidate	生物システム応用科学府　生物機能システム科学　専攻 博士後期課程　第一　専修/グループ(Department Course) 平成 28 年度入学(Your Entrance Fiscal Year) 氏名　李　珍光　㊞ (Your Name(Family, First) and Seal)				
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論文題目 Title	Characterization and ion-conductive properties of poly(ethylene carbonate)-based composite electrolytes and their application for lithium rechargeable batteries ポリエチレンカーボネート複合型電解質の物性とイオン伝導特性および二次電池への応用				

論文要旨（和文要旨(2000 字程度)または英文要旨(500words)）
※欧文・和文どちらでもよい。但し、和文の場合は英訳を付すこと。
Write a summary in Japanese (2000 characters) or in English (500words).
If the abstract is written in Japanese, needed to translate into English.

All-solid-state batteries (ASSBs), have taken global attention instead of typical liquid electrolytes. ASSBs have the potential for higher energy densities and safety than conventional lithium-ion batteries. Solid polymer electrolytes (SPEs) are one of electrolyte materials for ASSBs, which consist of polar polymers and metal salts, have greater safety and manufacturing workability. In the past several decades, SPEs have been mainly studied on polyether-based electrolytes such as poly(ethylene oxide) (PEO)-based electrolytes, due to its good ion-conductive behavior and high solubility for many kinds of metal salts. However, those polyether-based SPEs have effectively defects on the electrochemical properties for application towards rechargeable batteries.

In this dissertation, we focused on polycarbonate-based electrolytes such as poly(ethylene carbonate) (PEC). Because of not only its ion-conductive continuously increase with increasing salt concentration, but also the excellent cation (Li^+) transport abilities. These properties have never presented in polyether-based electrolytes. Moreover, PEC-based electrolytes demonstrate a high oxidation stability and a prevention effect of metal corrosion reaction in the highly concentrated electrolytes. Additionally,

polycarbonate materials are very worth noting even from an environmentally friendly point of view. PEC can be synthesized from carbon dioxide (CO_2) gas as monomer and biodegradable, low toxicity and so on. However, the ionic conductivity at room temperature and poor thermal and mechanical properties of PEC-based electrolytes are still needed to be improved for application of high performance batteries.

For solving above issues, composite polymer electrolytes (CPEs) of PEC-based electrolytes have been studied in the present study. PEC and poly(trimethylene carbonate) (PTMC) blend electrolytes were developed and their thermal, ion-conductive and electrochemical properties were investigated. The ionic conductivity of PEC and PTMC blend electrolytes increased with increasing Li salt concentration and PEC content. Moreover, blend electrolytes revealed better thermal properties and stable electrochemical abilities with Li anode than that of PEC and PTMC original electrolytes. The effect of the blended electrolytes also appeared in battery test results. In addition, ion-conductive and mechanical properties of PEC-based electrolytes reinforced by silica nanofiber were analyzed and the fiber size effect on electrolytes was also demonstrated.

According to these findings, it can be suggested that compounding of the electrolyte is an effective method for development of more excellent electrolytes for batteries. We also believe that the present study will contribute to real or practical application of ASSBs with polymer electrolytes in the future.

（英訳）※和文要旨の場合(300 words)
If the abstract is written in Japanese, needed to translate into English.(300 words)